

Measurements of Azimuthal Flow in BES Au+Au Collisions at RHIC by STAR

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Presentation outline

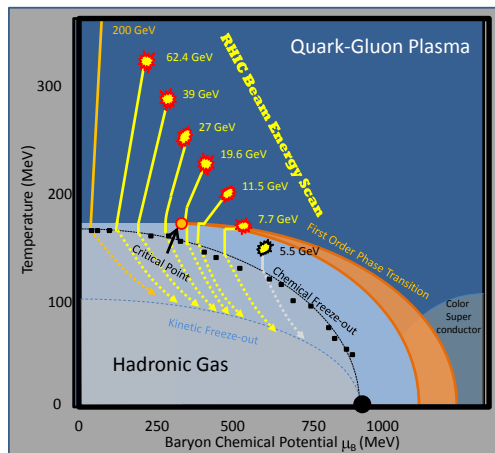
- ▶ Introduction to Beam Energy Scan(BES) program
- ▶ The ridge
- ▶ Analysis details
- ▶ Conclusions

About the BES program

In 2010 and 2011 RHIC completed phase I of the BES program with data sets at 7.7, 11.5, 19.6, 27 and 39 GeV.

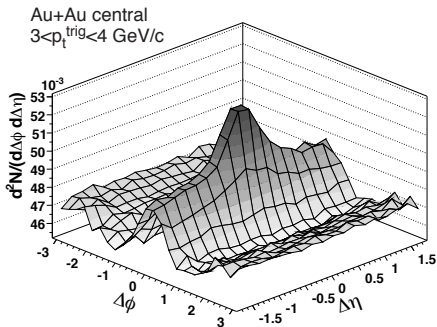
Goals of the BES program:

- ▶ Determine at which energy key QGP signatures turn off.
- ▶ Search for the critical point.



The QCD phase diagram

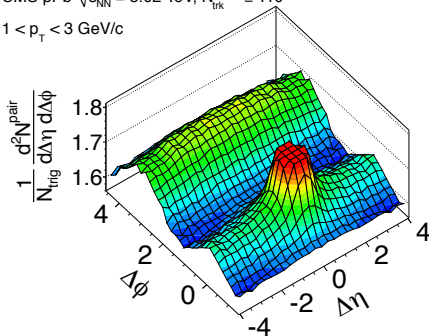
The Ridge: Evidence of deconfinement?



STAR ridge (Phys. Rev. C80 (2009) 064912)

CMS pPb $\sqrt{s_{NN}} = 5.02 \text{ TeV}$, $N_{\text{trk}}^{\text{offline}} \geq 110$

$1 < p_T < 3 \text{ GeV}/c$



p+Pb di-hadron correlations (Phys. Lett. B 718 (2013) 795)

- What happens at lower energies?

Correlation function

The correlation function we extract is:

$$C(\Delta\phi, \Delta\eta) = \frac{N_{mixed}}{N_{same}} \times \frac{N_{same}(\Delta\phi, \Delta\eta)}{N_{mixed}(\Delta\phi, \Delta\eta)}$$

two-particle Fourier coefficients:

$$v_n\{2\}^2 = \sum_i C_i \cos(n\Delta\phi_i) / \sum_i C_i$$

Data sets and event/track selections

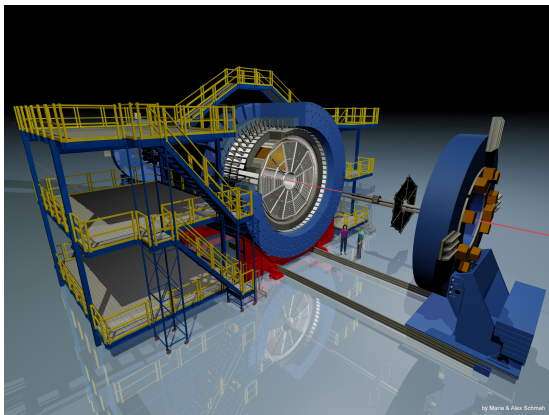
Au+Au collisions

center of mass energy

energy(GeV)	pvz cut(cm)
7.7	± 70
11.5	± 50
19.6	± 40
27	± 40
39	± 40

track cuts:

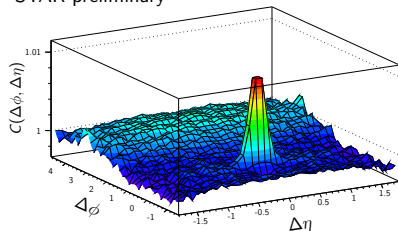
- ▶ $|\eta| < 1$;
- ▶ $0.2 < p_T < 2\text{GeV}/c$;
- ▶ number of TPC hits > 15 .



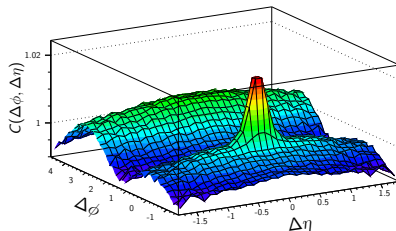
the STAR detector

AuAu $\sqrt{s_{NN}} = 7.7$ GeV $\Delta\phi\Delta\eta$ vs centrality

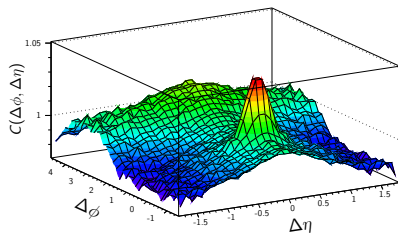
STAR preliminary 0 ~ 5%



20 ~ 30%



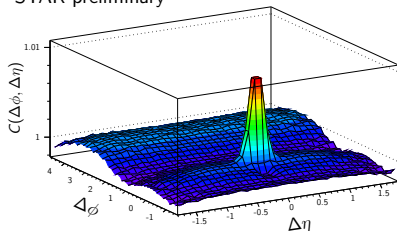
50 ~ 60%



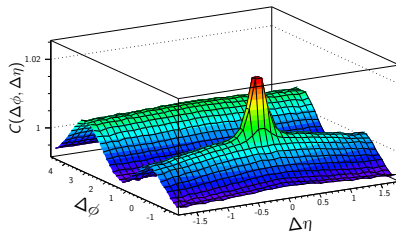
- ▶ Ridge persists down to the lowest energies;
- ▶ Strong away-side correlations.

AuAu $\sqrt{s_{NN}} = 19.6$ GeV $\Delta\phi\Delta\eta$ vs centrality

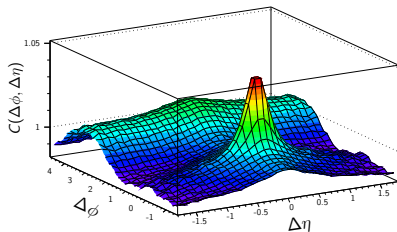
STAR preliminary 0 ~ 5%



20 ~ 30%

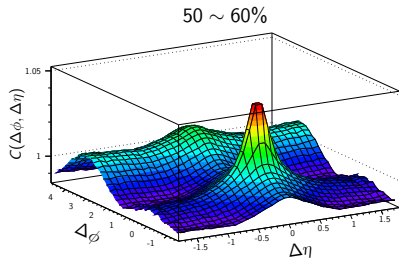
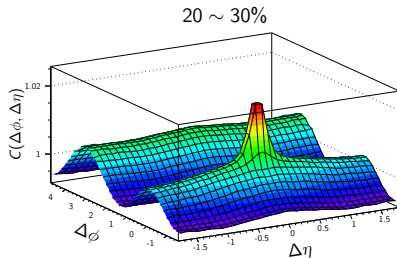
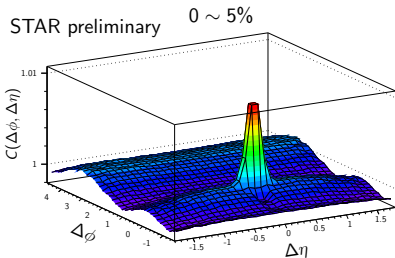


50 ~ 60%



► Ridge becomes stronger.

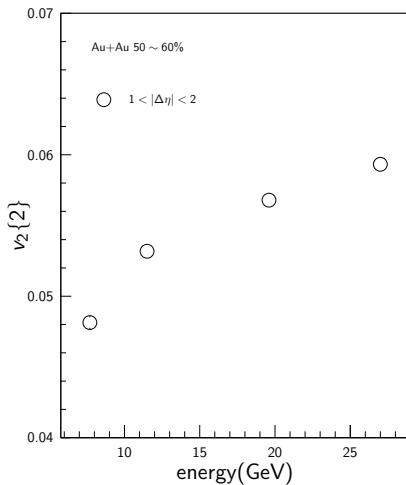
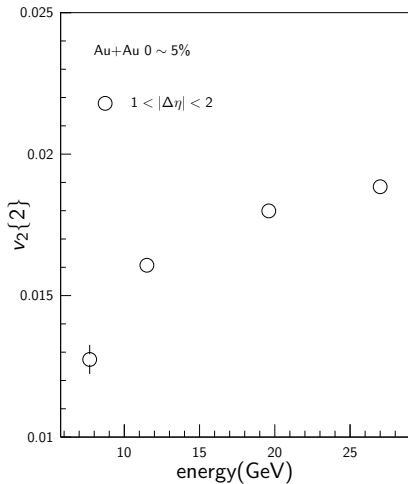
AuAu $\sqrt{s_{NN}} = 27$ GeV $\Delta\phi\Delta\eta$ vs centrality



► Correlations look similar to 19.6 GeV.

$v_2\{2\}$ vs energy

STAR preliminary



Conclusions

- ▶ Ridge persists down to the lowest energies.
- ▶ Relative away-side correlations decrease with increasing energy.
- ▶ Smooth increase in ridge 2nd order Fourier coefficient.